Mathematics

Year 10
Below satisfactory

WORK SAMPLE PORTFOLIO

Annotated work sample portfolios are provided to support implementation of the Foundation – Year 10 Australian Curriculum.

Each portfolio is an example of evidence of student learning in relation to the achievement standard. Three portfolios are available for each achievement standard, illustrating satisfactory, above satisfactory and below satisfactory student achievement. The set of portfolios assists teachers to make on-balance judgements about the quality of their students' achievement.

Each portfolio comprises a collection of students' work drawn from a range of assessment tasks. There is no pre-determined number of student work samples in a portfolio, nor are they sequenced in any particular order. Each work sample in the portfolio may vary in terms of how much student time was involved in undertaking the task or the degree of support provided by the teacher. The portfolios comprise authentic samples of student work and may contain errors such as spelling mistakes and other inaccuracies. Opinions expressed in student work are those of the student.

The portfolios have been selected, annotated and reviewed by classroom teachers and other curriculum experts. The portfolios will be reviewed over time.

ACARA acknowledges the contribution of Australian teachers in the development of these work sample portfolios.

THIS PORTFOLIO: YEAR 10 MATHEMATICS

This portfolio provides the following student work samples:

Sample 1	Algebra: Heptathlon scoring
Sample 2	Statistics: Statistical logic
Sample 3	Probability: Probability and Venn diagrams
Sample 4	Measurement: Trigonometry – why not?
Sample 5	Geometry: Similar or congruent?
Sample 6	Measurement and statistics: How thirsty can you get?
Sample 7	Algebra and geometry: Quadratic equations
Sample 8	Algebra: Simultaneous equations
Sample 9	Geometry: Numerical exercises in geometry
Sample 10	Statistics: Quartiles

Mathematics

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This portfolio of student work demonstrates solving surface area and volume problems relating to prisms and cylinders (WS6). The student finds unknown values after substitution into formulas (WS1, WS7), solves pairs of simultaneous equations (WS8) and solves simple quadratic equations (WS7). The student solves numerical exercises using geometrical properties (WS9) and uses triangle and angle properties to prove triangles are congruent and similar (WS5). The student explains how trigonometry can be used to find unknown sides and angles in right-angled triangles (WS4). The student lists outcomes for multi-step chance experiments and assigns probabilities for these experiments (WS3). The student evaluates statistical reports (WS2), investigates bivariate data where the independent variable is time (WS6), and calculates quartiles and inter-quartile ranges from a variety of data displays (WS10).

Algebra: Heptathlon scoring

Year 10 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task/s are highlighted.

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

Summary of task

Students had been practising their algebraic skills. They were interested in the results from the athletics carnival and questioned how the heptathlon was scored. They were given this task to compete in class to demonstrate how well they could apply their algebraic skills into a relevant context.

Algebra: Heptathlon scoring

Heptathlon Scoring

In the Olympics, "all-round" women athletes compete in the Heptathlon. Held over two days, the athletes compete in the following events:
Day 1— 100 metres hurdles, high jump, shot put, and 200 metres
Day 2— long jump, javelin, and 800 metres.

Points are awarded for each event, and the athlete with the greatest total points is declared the winner. But how do they decide how many points to award to a particular performance, and how can you compare events? For example, how do you compare a 25 second performance in the 200 metre event with throwing the discus 75 metres?

Mathematics, Physics, and Computer Modelling were used by Dr Karl Ulbrich to create the current scoring system, which attempts to make fair comparisons between events.

There are three main rules used for calculating points in the seven events:

- The track events (200 m; 800 m; and 100 m hurdles): $P = a \times (b - T)^c$
- The jump events (high jump and long jump): $P = a \times (M - b)^c$
- The throwing events (shot put and javelin): $P = a \times (D - b)^c$

In these rules, P is the point score; T is the time in seconds; M is measurement in cm; and D is the distance in metres. a, b, and c are different for each event, as shown in the table:

EVENT	a	b	c
200 m	4.99	42.5	1.81
800 m	0.11	254	1.88
100 m hurdles	9.23	26.7	1.84
high jump	1.85	75.0	1.35
long jump	0.19	210	1.41
shot put	56.0	1.50	1.05
javelin	16.0	3.80	1.04

For example, a 29.30 second performance in the 200 metre event, would give the following number of points:

$$P = 4.99 \times (42.5 - 29.3)^{1.81}$$
$$= 532.6$$

Annotations

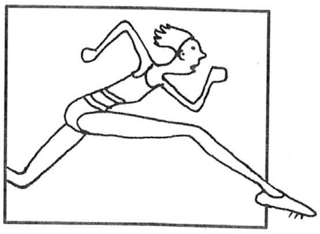
Algebra: Heptathlon scoring

1. Write the appropriate rule to work out the points in each of the following cases, and then work out the points, using your calculator:

- a 32-second performance in the 200 m

$P = 4.99 \times (42.5 - 32)$

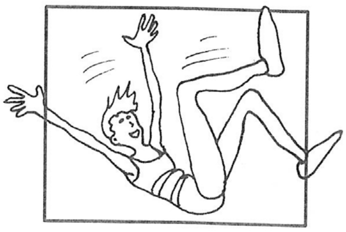
$= 52.395$



- a high jump of 1.80 m

$P = 1.85 \times (180 - 75)^{1.35}$

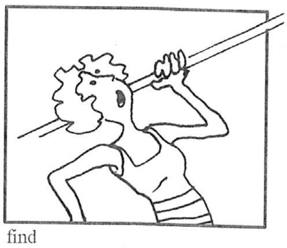
$= 194.25$



- a javelin throw of 65 m

$P = 16 \times (65 - 3.8)^{1.04}$

$= 979.2$



2. Using whatever method you think appropriate, find

- the time a runner would need to score 1000 points in the 200 m.

$1000 = 4.99 \times (42.5 - \underline{T})^{1.81}$

$=$

Annotations

Attempts to substitute into the given formula but omits the power of 'c'.

Substitutes into formula but makes errors in calculation.

Substitutes into formula but cannot complete calculation.

Algebra: Heptathlon scoring

- the distance in the long jump which would score the same number of points as a time of 1:55 in the 800 metre event.

$P = a \times (M - b)^c$

$= 0.19 \times (M - 210)^{1.41}$

Long jump $D =$

(800m) $P = a \times (b - T)^c$

$= 0.11 \times (254 - 115)^{1.88}$

$(139)^{1.88}$

3. At the 1988 Seoul Olympics, just before the last event (the 800 m), Jackie Joyner-Kersee of the USA needed 894 points to break the world record.

- What was the slowest time which Jackie could run and still break the world record

$894 = a \times (b - T)^c$

$= 0.11 \times (254 - \underline{\quad s \quad})^{1.88}$

[Incidentally, Jackie ran 2:08.51, giving her a final total of 7291 points—still the current world record]

4. Now make up your own challenging question about the Heptathlon which can be answered using the information you have been given about the scoring system, and provide the calculations and the answer.

How many points would you score if
a) you ran the 800m in 2 minutes then
b) jumped 2 metres in the high jump?

a) $P = a \times (b - T)^c$

$= 0.11 \times (254 - 200)^{1.88}$

$=$

$+$

b) $P = 1.85 \times (200 - 75)^{1.35}$

$P = 1.85 \times 125^{1.35}$

$=$

Answer $= a + b$

Annotations

Makes substitutions but does not complete calculation.

Writes a question, completes substitutions but cannot calculate answer.

Statistics: Statistical logic

Year 10 Mathematics achievement standard

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Summary of task

Students had spent some time looking at media reports of statistical data. This task was given as a 10-minute test to evaluate how students could discern the facts from some statements.

Statistics: Statistical logic

Statistical Logic

Please comment on the three following uses of statistics. Does the logic in the statement make sense? Please explain your reasoning.

- "Young people account for 30% of all road accidents. Of course, this means that older drivers account for 70% of all road accidents- many more. The older drivers should get off the road and leave it to us young ones!"

No as there are other factors that you need to take into account. Such as natural disasters, the state the driver is in and the car

- "What is happening to our school system? It's a disgrace-50% of our students are below the school average!"

The average depends on how many student and their marks. While the other side is above the school average and have higher marks. The ones below the average could have almost as high. Someone has to be below the average

- A doctor informed a patient that he had a life-threatening disease, for which about 9 out of 10 patients usually died. "The good news", the doctor said, "is that my last nine patients have all died!"

The good news is …

Just because 9/10 patients it does not mean the 10th patient will survive. It means out of the total patients, it is said that 10% survive

Annotations

Makes statements without mathematical reasoning.

Demonstrates limited understanding of the meaning of the statement.

Draws a sensible conclusion.

Probability: Probability and Venn diagrams

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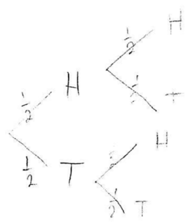
Summary of task

Students had completed a unit of work on probability. They had spent several lessons applying their knowledge to experiments, recording results and calculating probabilities. Students were encouraged to reason through some problems and justify their conclusions using mathematical language. This task was given as a test during class time.

Probability: Probability and Venn diagrams

Knowledge and Understanding
Question 1

a) Use a tree diagram to show the sample space for tossing 2 coins **simultaneously**.



b) Determine the probability of obtaining 1 head and a tail

$P(1H \cap 1T) = P(1H) \times P(1T)$
$= \frac{2}{4} \times \frac{2}{4}$
$= \frac{1}{4}$

c) Determine the probability of obtaining at least 1 head.

$P(\text{at least } 1H) = \frac{1}{3}$

Question 2

An equal- sector spinner containing numbers 1, 2, 3, and 4 is spun and an unbiased coin is tossed.

a) Draw a two way table to represent the sample space.

COIN

SPINNER	H	T
1	1H	1T
2	2H	2T
3	3H	3T
4	4H	4T

b) Determine the probability of obtaining a head and a 4

$P(H \cap 4) = P(H) \times P(4)$
$= \frac{4}{8} \times \frac{2}{8}$
$= \frac{1}{8}$

c) Determine the probability of obtaining a tail or an even number

$P(T \cap \text{even no}) = P(T) + P(\text{even no})$
$= \frac{4}{8} + \frac{2}{8}$
$= \frac{3}{4}$

Annotations

Constructs and completes table to identify sample space.

Constructs tree diagram.

Calculates probabilities based on table.

Realises that the events are not mutually exclusive and correctly calculates probability.

Attempts to evaluate required probability without using information on tree diagram.

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Probability: Probability and Venn diagrams

Question 3

A box contains 3 red, 2 blue and 1 yellow marble. Two marbles are drawn **simultaneously** from the box. Determine the probability that they will be:

a) both red

R R R
B Y B

RR
RY
RB
BY
BR
BB
YR
YB
YY

$P(RR) = \frac{1}{9}$

b) red and blue

$P(R \cap B) = P(R) \times P(B)$

$= \frac{3}{5} \times \frac{2}{5}$

$= \frac{6}{25}$

c) both the same colour

$P(RR \cup YY \cup BB) = P(RR) + P(YY) + P(BB)$

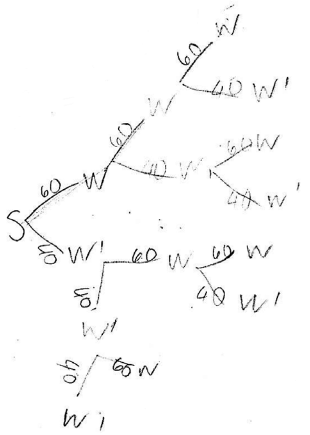
$= \frac{1}{9} + \frac{1}{9} + \frac{1}{9}$

$= \frac{1}{3}$

Question 4

In a chess tournament each contestant must play three others. Su estimates that she has a 60% chance of winning a game.

a) Draw a tree diagram and list the sample space for the possible outcomes of Su's three games.



b) Find the probability of Su winning at least 2 games.

$P(\text{Su winning 2 games}) = \frac{6}{120}$

$= \frac{1}{2}$

Annotations

Constructs tree branches of tree diagram correctly but does not assign probability values to it.

Attempts to combine the probabilities of two or more events as described with errors.

Attempts to calculate probabilities with arithmetical errors.

Attempts to calculate probabilities.

Mathematics

Year 10
Below satisfactory

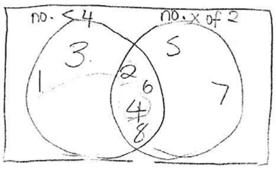
Probability: Probability and Venn diagrams

Question 5

An eight-sided die is rolled with faces numbered 1 – 8.

A is the event 'numbers less than 4' and B is the event 'numbers that are multiples of 2'.

a) Draw a Venn diagram to represent the above information.



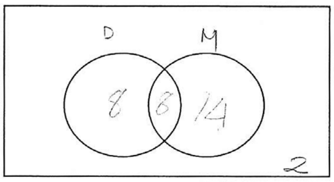
b) Calculate the probability that the number is less than 4 given that it is a multiple of 2.

c) Determine that probability that the number is a multiple of 2 given it is less than 4.

Question 6

A teacher surveys her class of students about their chocolate preferences. Out of 30 students, 16 students liked dark chocolate (D) and 22 students liked milk chocolate (M). Only 4 of the students surveyed liked neither milk nor dark chocolate.

(a) Show this on the Venn diagram below.



(b) Determine the probability that a randomly selected student from the class likes:

(i) both milk and dark chocolate

$P(M \cap D) = P(M) \times P(D)$

$= \frac{14}{30} \times \frac{8}{30}$

$= \frac{26}{[illegible]}$

(ii) milk chocolate only

$P(M) = \frac{14}{30}$

Annotations

Uses a diagram in an attempt to display information given in the question.

Attempts to answer the question but with errors.

Measurement: Trigonometry – why not?

Year 10 Mathematics achievement standard

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Summary of task

Students had been investigating trigonometry. They had looked at the applications and use of trigonometry. Students were asked to complete these questions as a formative assessment task to give the teacher an indication of how much revision the student required.

Mathematics

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Below satisfactory

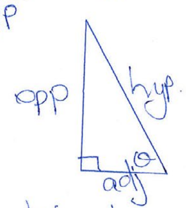
Measurement: Trigonometry – why not?

Trigonometry- Why not?

A person was quoted in the local paper as saying 'the things you learn at school are just not relevant when you leave school'. My Maths teacher was just horrified and asked the following questions:

1. Write down all that you know about the trigonometric ratios.
2. Why would people need these ratios in life outside school?

1. There are 3 trig ratios :-
$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{hyp}$



You use trig to calculate sides and angles of right angled triangles.

2. You use trig in building sites and finding unknown distances that you cannot measure. You can also use it for space travel to the moon because you cannot measure the distance from the earth to the moon with a tape measure.

Annotations

Recognises the three ratios.

Explains limited use of trigonometry in real contexts.

Geometry: Similar or congruent?

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Summary of task

Students had studied both similarity and congruence during the year. They were asked to make connections between the two concepts and to complete a task which involved both concepts. The teacher wanted to ensure that students could clearly identify the difference between similarity and congruence.

Mathematics

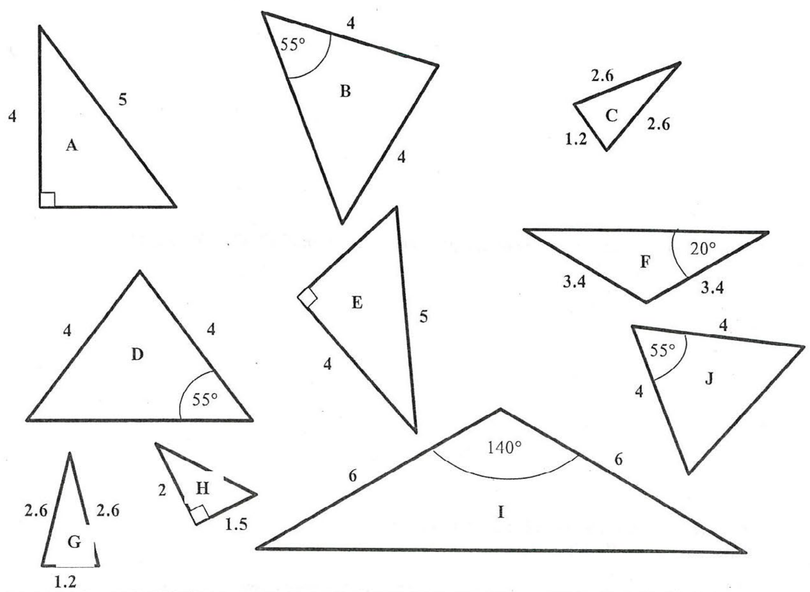
Year 10

Below satisfactory

Geometry: Similar or congruent?

Similar? Congruent?

1. Consider the following triangles and complete the table below. (All lengths are in centimetres)



Which triangles are similar?	Which triangles are congruent?	Reasons for congruency
B and J G and F	B and D I and F	because they measure the same.

Annotations

Recognises one of the congruent pairs but mistakes a similar pair for a congruent pair.

Lists only two similar triangles and omits others.

Does not use mathematical reasoning to demonstrate congruence.

Measurement and statistics: How thirsty can you get?

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Summary of task

Students had spent two weeks investigating surface area and volume. They were given this task as an assignment to apply the skills they had learnt in class to a real-world problem. They were asked to solve the problem using their knowledge of surface area and volume to perform calculations and justify their results.

Measurement and statistics: How thirsty can you get?

Task 1

Monthly Water Supply: (volume of water) no. 584.4

January
area × height
= 200 × 0.195
= 39 m^3

February
area × height
= 200 × 0.2
= 40 m^3

March
= area × height
= 200 × 0.14
= 28 m^3

April
= area × height
= 200 × 0.08
= 16 m^3

May
= area × height
= 200 × 0.06
= 12 m^3

June
= area × height
= 200 × 0.04
= 8 m^3

July
= area × height
= 200 × 0.03
= 6 m^3

August
= area × height
= 200 × 0.02
= 4 m^3

September
= area × height
= 200 × 0.03
= 6 m^3

October
= area × height
= 200 × 0.07
= 17 m^3

November
= area × height
= 200 × 0.095
= 19 m^3

December
= area × height
= 200 × 0.16
= 32 m^3

Annotations

Determines the volume, in cubic metres, of a rectangular prism using a known formula.

Determines the water supply for each month.

Measurement and statistics: How thirsty can you get?

Monthly Water Usage

January
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

Feburary
$= 584.4 \div 1000$
$= 0.5844 \times 28$
$= 16.36 m^3$

March
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

April
$= 584.4 \div 1000$
$= 0.5844 \times 30$
$= 17.5 m^3$

May
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

June
$= 584.4 \div 1000$
$= 0.5844 \times 30$
$= 17.5 m^3$

July
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

August
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

September
$= 584.4 \div 1000$
$= 0.5844 \times 30$
$= 17.5 m^3$

October
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

November
$= 584.4 \div 1000$
$= 0.5844 \times 30$
$= 17.5 m^3$

December
$= 584.4 \div 1000$
$= 0.5844 \times 31$
$= 18.1 m^3$

Annotations

Determines the water usage for each month.

Measurement and statistics: How thirsty can you get?

Water at the End of Each Month.

January
= 39 - 18.1
= 20.9

February
= 40 - 16.3
= 23.7

March
= 28 - 18.1
= 9.9

April
= 16 - 17.5
= ⁻1.5

May
= 12 - 18.1
= ⁻6.1

June
= 8 - 17.5
= -9.5

July
= 6 - 18.1
= -12.1

August
= 4 - 18.1
= -14.1

September
= 6 - 17.5
= ⁻11.5

October
= 17 - 18.1
= -1.1

November
= 19 - 17.5
= 1.5

December
= 32 - 18.1
= 13.9

Annotations

Calculates the difference between the water supply and water usage for each month.

Measurement and statistics: How thirsty can you get?

Table

Month	Water Supply	Water Usage	Water Left 1 month	Water left in Tank
January	39	18.1	20.9	20.9
February	40	16.36	23.7	44.6
March	28	18.1	9.9	54.5
April	16	17.5	-1.5	53
May	12	18.1	-6.1	46.9
June	8	17.5	-9.5	37.4
July	6	18.1	-12.1	25.3
August	4	18.1	-14.1	11.2
September	6	17.5	-11.5	-0.3 bought water
October	17	18.1	-1.1	-1.4 bought water
November	19	17.5	-1.5	-1.5 bought water
December	32	18.1	13.9	13.9

Task 3

A suitable tank that would choose would be the 60 tank because it fits how much storage I need for the water.

Task 4

60 tank = 1800
Water cost = -0.3
-1.4
-5.1
= -6.2
=$62

~~1800~~
~~62~~

1800
+ 62
1862

The total cost for the year would be $1862 So that I am able to cover all of my ~~neede~~ purchases.

Annotations

Shows the results of the previous calculations in a table.

Specifies the choice of tank but does not include correct units. Provides a basic reason for the choice.

Correctly calculates the cost of the suggested tank in the first year using the table of water supply/water consumption.

Mathematics

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Below satisfactory

Measurement and statistics: How thirsty can you get?

Modeling and Problem Solving Questio
Question 5

Month	Water left in tank	new amount
January	20.9	30
February	44.6	74.6
March	54.5	129.1
April	53	182.1
May	46.9	229
June	37.4	266.4
July	25.3	291.7
August	11.2	302.9
September	-0.3	302.6
October	-1.4	301.2
November	-1.5	299.7
December	13.9	313.6.

Annotations

Attempts to calculate the amount of water left in the tank at the end of each month in the second year, but incorrectly uses the monthly values from the first year instead of starting with the amount left in the tank at the end of the first year and recalculating the values based on water supply and usage.

Comprehends the nature of the problem and attempts to answer those parts of the task that rely on familiar facts and calculations.

Algebra and geometry: Quadratic equations

Year 10 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task/s are highlighted.

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

Summary of task

Students had spent some time solving quadratic equations and solving problems that required them to form a quadratic equation as a way to find a solution to a problem. This task was set as a class test that took 20 minutes.

Algebra and geometry: Quadratic equations

1 Which of the options given are the solution(s) to each of these equations?
*(Circle **all** that apply.)*

(a) $3y + 7 = 92 - 2y$ 5y−85=0 5y=85 y=17

A 6 B 7 C −6 D −7 E none of the above

(b) $x^2 - 24 = 5x$ $x^2-5x-24=0$ x= −8 and 3

A 8 B 12 C −2 D −3 E none of the above

(c) $m^2 = -100$

A 5 B −10 C 10 D −50 E none of the above

(d) $x^3 - 2x^2 - 11x + 12 = 0$

A −4 B 4 C −3 D 1 E none of the above

2 Provide **exact** solutions (i.e. $\sqrt{5}$, not 2.236) to the following equations.

a $y^2 = 4$

$y = \pm\sqrt{4}$

b $x^2 - 21 = 0$

$x^2 = 21$

$x = \pm\sqrt{21}$

c $\frac{2x^2 + 7}{3} = 100$

$2x^2 + 7 = 300$

$2x^2 = 293$

$x^2 = 146.5$

$x = \pm\sqrt{146.5}$

d $(a + 4)(a - 1) = 0$

a = −4 and 1

e $6(2m - 1)(3m + 4) = 0$

$6(6m + 8m - 3m - 4) = 0$

$6(14m - 3m - 4) = 0$

$6(11m - 4) = 0$

$66m - 24 = 0$

$66m = 24$

$m = 24/66$

Annotations

Solves a simple linear equation correctly.

Recognises that the quadratic equation needs to be rearranged before solving, but does not obtain correct solutions.

Recognises that some quadratic equations cannot be solved for real solutions.

Solves simple quadratic equations, demonstrating understanding of the concept of an exact solution.

Demonstrates some knowledge of how to solve simple quadratic equations given in factored form.

Demonstrates a correct procedure for solving a simple quadratic equation involving a fraction, but does not leave the answer in simplest exact form.

Algebra: Simultaneous equations

Year 10 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task/s are highlighted.

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

Summary of task

Students completed a unit of work on equations. The unit included looking at different methods of solving linear and simultaneous equations, including applying these techniques to solve word problems. The students were given 20 minutes to complete this assessment task.

Algebra: Simultaneous equations

1 How many solutions does the equation $7x + 5y = 24$ have? Explain.

2 Solve $2x - y = 5$ if:

(i) $x = 5$

$10 - y = 5$
$y = 5$

(ii) $y = -2$

$2x - (-2) = 5$
$2x + 2 = 5$
$2x = 3$
$x = 1.5$

3 Solve the following equations simultaneously:

(i) $3x + y = 10$ and $x - y = -2$

$① + ② = 4x = 8$
$x = 2$
sub $x = 2$ into ①
$6 + y = 10$
$y = 4$
$(2, 4)$

sub $x = 2$ into ②
$2 - y = -2$
same

(ii) $2x + 9y = 43$ and $y = x - 1$

$② \times 2 = 2y = 2x - 2$ ③
$① - ③ = 11y = 45$
$y = \frac{45}{19}$

sub $y = \frac{45}{11}$ into ①
$6\frac{2}{11} = 2x$
$x = 3\frac{1}{11}$
$(3\frac{1}{11}, 4\frac{1}{11})$

sub $y = \frac{45}{11}$ into ②
$4\frac{1}{11} = x - 1$
$5\frac{1}{11} = x$
$(5\frac{1}{11}, 4\frac{1}{11})$

Annotations

Finds the value of one variable given the value of the other.

Demonstrates understanding of the substitution method in solving simultaneous equations.

Demonstrates some understanding of the elimination method to solve a pair of simultaneous equations but is unable to manipulate the algebraic expressions to find the correct solution.

Substitutes the value obtained for one variable to find the value of the other but does not write the answer in a format that suits the context of the question.

Algebra: Simultaneous equations

3 *(continued)*

(iii) ① $7x - 3y = -20$ and ② $3x + 5y = 31$

$① \times 3 = 21x - 9y = -60$ ③

$② \times 7 = 21x + 35y = 217$ ④

$③ + ④ = 26y = 157$

$y = \frac{157}{26}$

sub $y = \frac{157}{26}$ into ①

$7x - (3 \times \frac{157}{26}) = -20$

$7x = -20 + (3 \times \frac{157}{26})$

$7x = -1\frac{23}{26}$

$x = -\frac{7}{26}$ $\quad (-\frac{7}{26}, \frac{157}{26})$

sub into ②

$3x + (5 \times \frac{157}{26}) = 31$

$3x = 31 - (5 \times \frac{157}{26})$

$3x = \frac{21}{26}$

$x = \frac{7}{26}$ $\quad (\frac{7}{26}, \frac{157}{26})$

Annotations

Demonstrates some understanding of the elimination method to solve a pair of simultaneous equations but is unable to manipulate the algebraic expressions to find the correct solution.

Correctly substitutes the value obtained for one variable to find the value of other variable.

Mathematics

Year 10
Below satisfactory

Geometry: Numerical exercises in geometry

Year 10 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task/s are highlighted.

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Summary of task

Students had studied a unit of work on geometrical reasoning. An assessment task was given at the end of the unit. Students were expected to spend between 10 and 15 minutes to complete this task.

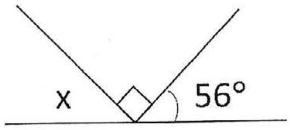
Mathematics

Year 10
Below satisfactory

Geometry: Numerical exercises in geometry

Calculate the values of the unknown angles x in each of the diagrams below.

a)

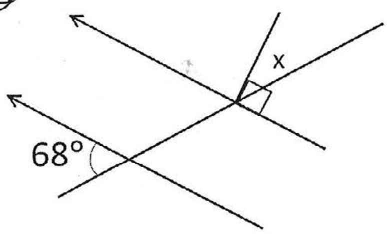


$x + 56 = 180°$

$x + 56 - 56 = 180 - 56$

$x = 124°$

b)

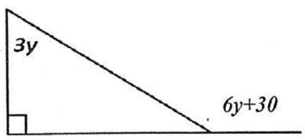


$x + 68 = 180°$

$x + 68 - 68 = 180 - 68$

$x = 112°$

Calculate the value of *y* in the following diagram.



$3y + 6y + 30 + 90 = 180$

$\cancel{3y}\ 9y + 120 - 120 = 180 - 120$

$\frac{9y}{9} = \frac{60}{9}$

$y = 6.6$

Annotations

Recognises the straight angle but does not establish a correct equation to solve the problem.

Attempts to solve the problem using an equation but is unable to apply the angle properties required.

Recognises the angle sum of a triangle can be used but does not realise that one of the given angles is an exterior angle of the triangle.

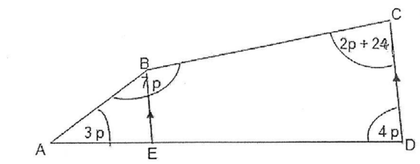
Mathematics

Year 10
Below satisfactory

Geometry: Numerical exercises in geometry

(a) *Use algebraic methods to find the value of p.*

(b) *Determine the size of ∠ABE.*



a. $3p + 7p + 4p + 2p \div 24 = 360$

$16p \div 24 \times 0 = 360$

$\frac{16p}{16} = \frac{360}{16}$

$p = 22.5$

b. $\Delta ABE = 180°$

$AB = 3p + 7p$

$= 3 \times 22.5 + 7 \times 22.5$

$= 225$

$E = 3p + 4p = 180°$

$\frac{7p}{7} = \frac{180}{7}$

$E = 25.71$

$\Delta ABE = 225 + 25.71$

$= 250.71$

Annotations

Recognises that the angle sum of a quadrilateral is required and establishes an equation to solve the problem but cannot solve the equation correctly.

Is unable to apply the angle properties required.

Mathematics

Year 10
Below satisfactory

Statistics: Quartiles

Year 10 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task/s are highlighted.

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

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Summary of task

Students had spent some time studying statistics, including the calculation of quartiles and inter-quartile ranges in five-number summaries from a variety of data displays. This task was set for students to complete in 20 minutes of class time.

Statistics: Quartiles

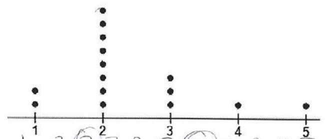
In this work sample, you will calculate the five-number summary for several data sets. The data sets are labelled **A–G**, and your answers are to be placed in the table in the middle of the page.

A	4	7	8	8	10	16	18	19	19	20	23	23	24			
B	4	7	8	8	10	16	18	19	19	20	23	23	24	27		
C	4	7	8	8	10	16	18	19	19	20	23	23	24	27	28	
D	4	7	8	8	10	16	18	19	19	20	23	23	24	27	28	29

E

Score	Frequency
1	8
2	11
3	15
4	2
5	9
6	15
7	18

F



1 1 2 2 2 2 2 2 2 2 3 3 3 4 5

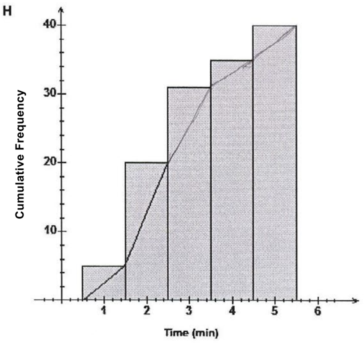
G

Stem	Leaf
0	3 4
0	8 9 9
1	2 2 3 4 4 4
1	5 6 7 7 7 8 8
2	0 1 1 1 2 2 3 4

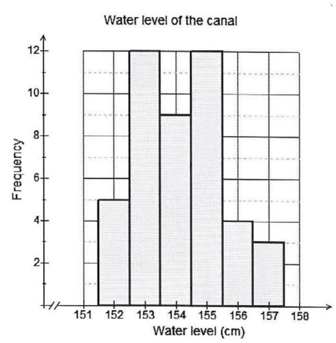
3 4 8 9 9 12 12 13 14
14 14 15 16 17 17 17 18 18
20 21 21 21 22 22 23 24

	Min	Q1	Med	Q3	Max	IQR
A	4	8	18	21	24	13
B	4	8	18.5	23	27	15
C	4	8	19	23	28	15
D	4	9	19.5	23.5	29	14.5
E						
F	1	2	2	3	5	1
G	3	12	16.5	21	24	9
H						
I						

H



I



Annotations

Determines quartiles and inter-quartile ranges for ordered lists of data but with some inaccuracies.

Determines quartiles and inter-quartile ranges from data displayed in dot plots and stem-and-leaf plots.

Does not attempt to determine the values of the quartiles and inter-quartile range for continuous data displayed in a cumulative frequency histogram.

Does not attempt to determine the quartiles and inter-quartile range from data displayed in a frequency table and a frequency histogram.