Sydney Girls High School

Mathematics

Year 9 Common Task 1
2016

Time Allowed: 60 minutes + 5 minutes reading time

Topics: Computation & financial mathematics
Expressions, equations & inequalities
Length, area, surface area & volume
Indices & surds
Probability & single variable data analysis

Total: 60 marks

Instructions:

- There are FIVE (5) Questions of equal value.
- Attempt all questions.
- Full marks may not be awarded for careless or incomplete setting out.
- Start each Question on a new page.
- Write on one side of the paper only.
- Diagrams are NOT drawn to scale.
- Board-approved calculators may be used.

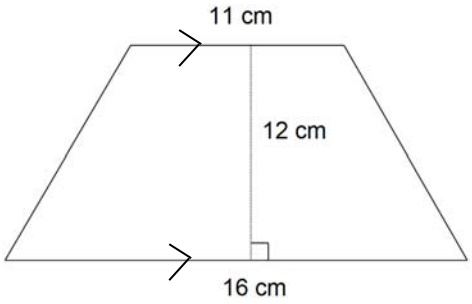
Student's Name: _____ Teacher's Name: _____

QUESTION 1 (12 Marks)

MARKS

a) Solve $6(x-2)=20$ 2

b) Find the area of the following figure. 2



c) The table below shows all the possible sums when two dice are rolled. 2

+	●	●●	●●	●●	●●	●●
●	2	3	4	5	6	7
●●	3	4	5	6	7	8
●●	4	5	6	7	8	9
●●	5	6	7	8	9	10
●●	6	7	8	9	10	11
●●	7	8	9	10	11	12

If two dice are rolled, what is the probability of getting a sum less than 6?
Express your answer in simplest form.

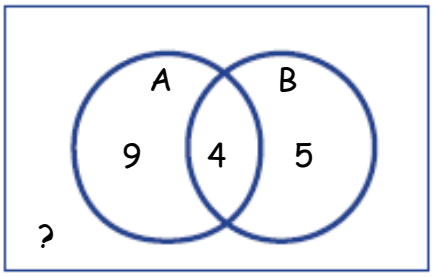
d) Simplify $\dfrac{x^2\times(xy)^3}{(2x)^4}$ 2

Question 1 continued on next page

QUESTION 1 continued

e) The distance from the Earth to the Sun is approximately 1.52×10^{8} km. The speed of light is approximately 3×10^{8} m/s. How many seconds would it take to travel from the Earth to the Sun if travelling at the speed of light, correct to 3 significant figures. 2

f) The diagram below shows how many chickens tested positive for virus A or virus B. 2



The probability of selecting a chicken with virus A is $\frac{1}{4}$.

How many chickens had neither virus?

QUESTION 2 (12 Marks) Start a new page

MARKS

a) A plane is 19m long. If I make a model of the plane in the ratio of 1:40, what length will my model plane be in cm? 2

b) Solve $3y - \frac{2y}{3} < 5$ 2

c) This shape is made up of 1 semicircle, with a 6 cm diameter, and 4 smaller semicircles of equal diameter. 2



Calculate its exact perimeter, leaving your answer in terms of π.

d) Simplify $6(y^3)^0 \times (6y^3)^0$ 2

e) Simplify $5\sqrt{3} + \sqrt{50} - \sqrt{12}$ 2

f) The numbers 1, 2, 3 and 4 (in any order, repeats allowed) are used to write a two digit number. What is the probability that the two digit number formed will be greater than 20? 2

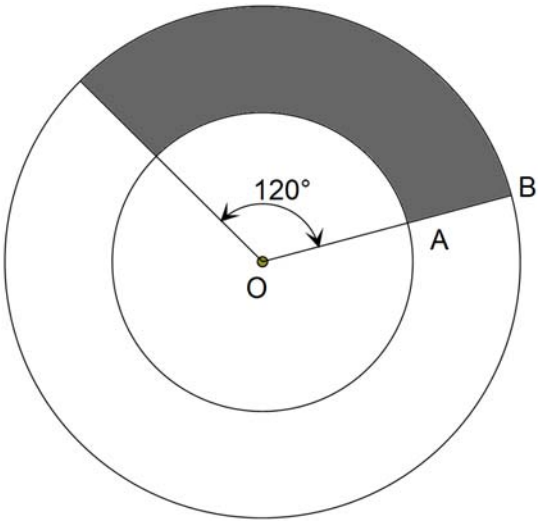
QUESTION 3 (12 Marks) Start a new page

MARKS

a) Ciara bought a block of land for $40 000. After ten years, she sold the land for $186 000. Calculate her percentage profit on her cost price. 2

b) If a father is five times as old as his son at present, how old is the father if he was 32 years old when his son was born? 2

c) O is the centre, OA = 10cm and OB = 20cm. Calculate the shaded area, correct to 1 decimal place. 2



d) Simplify $(2xy^2)^{-1} \times 4x^3$, writing your answer without negative indices 2

e) Simplify fully $5\sqrt{6}(2\sqrt{6} - 3\sqrt{2})$ 2

f) Results of a pre-election survey showed: 2

Blue party	70 votes
White party	45 votes
Red party	35 votes

Predict the number of Blue party voters if there are 3000 votes in total.

QUESTION 4 (12 Marks) Start a new page

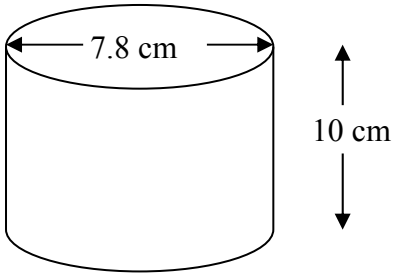
MARKS

a) Tom invested \$8000 at 5% p.a. simple interest for 3 years. How much extra interest would Tom have earned if he had invested his money at 5% p.a. with interest compounded annually for 3 years? 3

b) A student purchased 10 books and 5 pens for \$22.50. The cost of one book and one pen is \$3.15. Calculate the cost of the 10 books by constructing and solving a pair of simultaneous equations. 3

c) Julie is cutting out labels to fit jars of jam. The labels must fit exactly, completely covering the curved surface. The diameter of a jar is 7.8 cm and the height is 10 cm. 3

What amount of paper, to the nearest cm^2, does Julie need for the labels if she is to cover 20 jars?



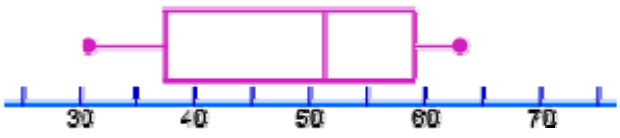
d) Simplify $(9x^4y^5)^{\frac{1}{2}}$, expressing your answer without fractional indices. 2

e) 1

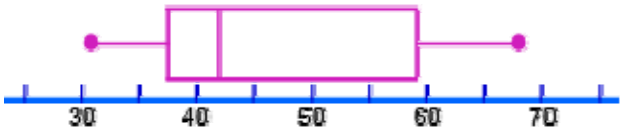
Stem	Leaf
3	1 4 7
4	2 5
5	1 6 6 9
6	3 8

Which of these box plots (A, B or C) matches the data shown in the stem-and-leaf plot?

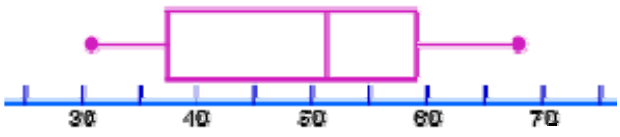
A



B



C



QUESTION 5 (12 Marks) Start a new page

MARKS

a) Tax Rates table 2015-16 — 3

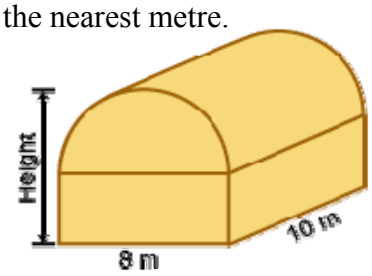
Taxable income	Tax on this income
0 to $18,200	Nil
$18,201 to $37,000	19c for each $1 over $18,200
$37,001 to $80,000	$3,572 plus 32.5c for each $1 over $37,000
$80,001 to $180,000	$17,547 plus 37c for each $1 over $80,000
$180,001 and over	$54,547 plus 45c for each $1 over $180,000

i) Alice's Medicare levy is $2478.30, which is 2% of her taxable income. What is Alice's taxable income?

ii) Calculate the Tax payable on her taxable income, using the tax table above.

b) Solve $3(x^2-2)=x^2$ where $x<0$ — 3

c) This marquee tent is in the shape of a rectangular prism with a half-cylinder on top. The width of the tent is 8m and the length of the tent is 10m. The volume of air inside this tent is 491 m^3 (to the nearest m^3). How high is the tent at its highest point? Answer correct to the nearest metre. — 3



d) If n (A) = 12, n (B) = 6, n (A ∪ B) = 15, find n (A ∩ B). — 1

e) A set of data has a mean of 4.25. When the outlier of 20 is removed, the mean changes to 3.2. How many scores are in the original data set? — 2

END OF TEST

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Yr 9 Common task 1

2016

Q1

a) $6(x-2) = 20$

$6x - 12 = 20$

$6x = 32$

$x = \frac{32}{6}$

$x = 5\frac{1}{3}$

b) Area $= \frac{1}{2}(14+16)12$

$= 6 \times 27$

$= 162 \text{ cm}^2$

c) $P(\text{sum} < 6) = \frac{10}{36}$

$= \frac{5}{18}$

d) $\frac{x^2 \times (xy)^3}{(2x)^4}$

$= \frac{x^2 \times x^3 \times y^3}{16x^4}$

$= \frac{xy^3}{16}$

e) $t = \frac{d}{s}$

$= \frac{1.52 \times 10^8 \times 10^2}{3 \times 10^5}$

$= 507 \text{ Sec.}$

f) let the number of chickens be x

$\therefore \frac{13}{x} = \frac{1}{4}$

$x = 52$

The numbe of chickens had neither virus

$= 52 - 5 - 4 - 9$

$= 32$

Year 9 common Task I (2016)

2

a) Plane length = 19 m = 1900 cm

Ratio of model to Plane length 1 : 40

model length = $\frac{1900}{40} = 47.5$ cm

b) $3y - \frac{2y}{3} < 5$

$\times 3$

$9y - 2y < 15$

$7y < 15$

$\div 7$

$y < \frac{15}{7}$

c. Radius of the larger Semicircle = $\frac{6}{2} = 3$ cm

Radius of each smaller Semicirde = $\frac{6}{4 \times 2} = \frac{3}{4}$ cm

Perimeter of the shape = $\frac{2\pi \times 3}{2} + \frac{4 \times 2\pi \times 3}{2 \times 4}$

$= 3\pi + 3\pi$

$= 6\pi$ cm

Note: many students were confused about the perimeter of a semicircle

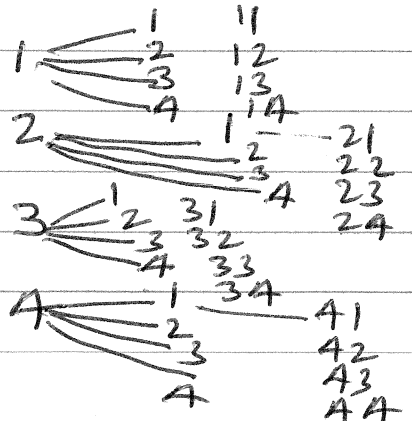
d) $6(y^3)^0 \times (6y^3)^0 = 6 \times 1 \times 1 = 6$

e) $5\sqrt{3} + \sqrt{50} - \sqrt{12}$

$= 5\sqrt{3} + 5\sqrt{2} - 2\sqrt{3}$

$= 5\sqrt{2} + 3\sqrt{3}$

f.



$(P > 20) = \frac{12}{16} = \frac{3}{4}$

Question 3

a) % profit on cost $= \frac{\text{Profit}}{\text{cost}} \times 100\%$

$= \frac{186\,000 - 40000}{40,000} \times 100\%$

$= 365\%$

b) Let x = sons present age

$\therefore 5x$ = fathers " "

$5x + 32 = x$

$4x = 32$

$x = 8$

$\therefore$ Fathers age $= 5x$

$= 40$ yrs old (some working required for full marks)

c) $A = \frac{\theta}{360}(\pi r_1^2 - \pi r_2^2)$

$= \frac{120}{360}(\pi \times 20^2 - \pi \times 10^2)$

$= \frac{1}{3}(400\pi - 100\pi)$

$= \frac{300\pi}{3}$

$= 100\pi$

$\doteq 314.2\,cm^2$ (to 1d.p)

* important to avoid rounding until the last step

d) $(2xy^2)^{-1} \times 4x^3$

$= \frac{1}{2xy^2} \times 4x^3$

$= \frac{2x^2}{y^2}$

e) $5\sqrt{6}(2\sqrt{6} - 3\sqrt{2})$

$= 10 \times 6 - 15 \times \sqrt{12}$

$= 60 - 15 \times 2\sqrt{3}$

$= 60 - 30\sqrt{3}$

f) Blue party voters $= \frac{70}{150} \times 3000$

$= 1400$

4 a) Simple I = $8000 × 0.05 × 3

= $1200

A = $8000 × (1+0.05)³

= $9261

Compound I = $9261 − $8000

= $1261

Extra I = $1261 − $1200

= $61

Many students forgot to calculate the compound interest

b) Let b be the cost of a book

" f " " " " " " a fan

10b + 5f = $22.50

b + f = $3.15 $\xrightarrow{\times 5}$ 5b + 5f = $15.75

∴ 5b = $6.75

10b = $6.75 × 2

= $13.50

∴ the price of 10 books is $13.50

Many students forgot to calculate the cost of 10 books

c) C.S.A. = $2 \times \pi \times \frac{7.8}{2} \times 10$

$= 78\pi$

Amount of paper = $78\pi \times 20$

$= 1560\pi$ cm²

Many students mistakenly included the area of the top and bottom.

d) $9^{\frac{1}{2}} x^2 y^{\frac{5}{2}} = 3x^2 y^2 y^{\frac{1}{2}}$

$= 3x^2 y^2 \sqrt{y}$

Many students neglected to simplify $y^{\frac{5}{2}}$ or $\sqrt{y^5}$.

Year 9 Common Task 1 – 2016

Question 5

a) i) Taxable income

$= 2478.30 \div 2 \times 100$

$= \$123,915$ (1)

ii) Tax payable

$= 17,547 + 0.37 \times (123,915 - 80,000)$

$= \$33,795.55$ (2)

b) $3(x^2 - 2) = x^2$

$3x^2 - 6 = x^2$

$2x^2 = 6$

$x^2 = 3$ (1)

$x = \pm\sqrt{3}$ (1)

$x = -\sqrt{3}$, $x < 0$ (1)

* Exact solution required.
* Approximate answer – 1 mark

c) $V = lbh + \frac{1}{2}\pi r^2 h$

$491 = 8 \times 10 \times h + \frac{1}{2} \times \pi \times 4^2 \times 10$

$491 = 80h + 80\pi$

$80h = 491 - 80\pi$

$h = \frac{491 - 80\pi}{80}$

$h \doteq 3$ m (to nearest m)

∴ Height of tent $\doteq 4 + 3$

$\doteq 7$m (3)

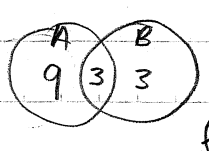
d) $n(A \cap B)$

$= n(A) + n(B) - n(A \cup B)$

$= 12 + 6 - 15$

$= 18 - 15$

$= 3$



(1)

e) Let x = no. of scores in original data set

y = sum of original data set

$\frac{y}{x} = 4.25$ ..... ①

$\frac{y - 20}{x - 1} = 3.2$ ..... ②

Rearrange ①:

$y = 4.25x$ ..... ③

Sub ③ in ②:

$\frac{4.25x - 20}{x - 1} = 3.2$

$4.25x - 20 = 3.2x - 3.2$

$1.05x = 16.8$

$x = 16$

∴ 16 scores in original data set (2)

OR

Let x = original no. of scores

$\frac{4.25x - 20}{x - 1} = 3.2$

$4.25x - 20 = 3.2x - 3.2$

$1.05x = 16.8$

$x = 16$

∴ 16 scores

Full marks not awarded if correct working not shown