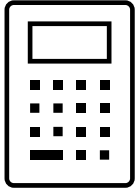


Surname:

Forename(s):

GCSE Mathematics – Higher Tier

Paper 3 – Calculator



Practice Set A

ANSWERS



Materials

- **Formulae Sheet** (on the next page)
- **Black** ink or ball-point pen
- Pencil
- Eraser
- Protractor
- Compass
- Tracing Paper
- **Calculator allowed**

/40

Instructions

- Time allowed: **45 minutes**.
- The total mark for this paper is **40**.
- Show **all** of your working.
- Draw diagrams in pencil.
- Plot graphs in pencil.
- Diagrams are **not** accurately drawn, unless otherwise indicated.
- Cross through any work you don't want to be marked

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)h$

Volume of a prism = area of cross section $\times$ length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

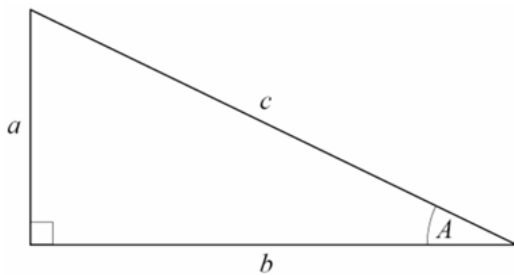
Area of a circle = πr^2

Quadratic Formula

The solution of $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry

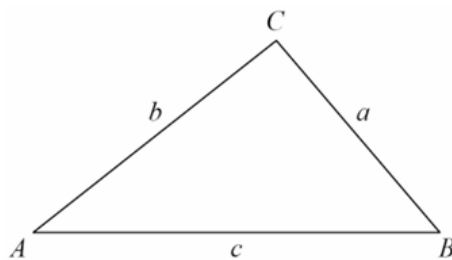


In any right-angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a , b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$



In any triangle ABC where a , b and c are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area of triangle} = \frac{1}{2}ab \sin C$$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B :

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B)P(B)$$

- 1 Zanha works 25 hours per week in the UK.
She is paid £463.50 per week

Zanha applies for the same job in Australia.
The rate of pay is 33.41 Australian dollars per hour.

£1 = 1.796 Australian dollars

$$\begin{array}{r} \text{£1} \\ \times 1.796 \\ \hline \end{array}$$

Which country has a greater rate of pay for this job?
You must show how you get your answer.

Rate of pay UK

$$= \frac{463.50}{25} = \boxed{\text{£}18.54}$$

Rate of pay Australia

$$= \boxed{\$33.41}$$

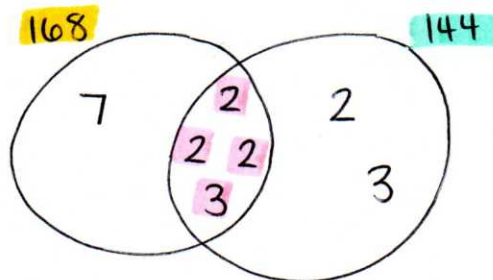
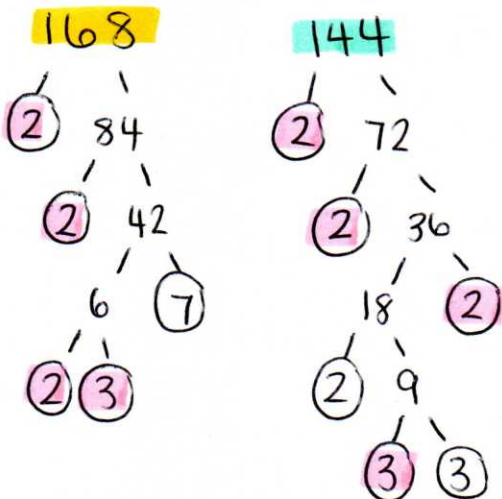
$$\text{£}18.54 \times 1.796 = \boxed{\$33.30}$$

$$\$33.30 < \$33.41$$

Australia has a greater rate of pay.

(Total for question 1 is 3 marks)

- 2 Work out the lowest common multiple (LCM) of 168 and 144.

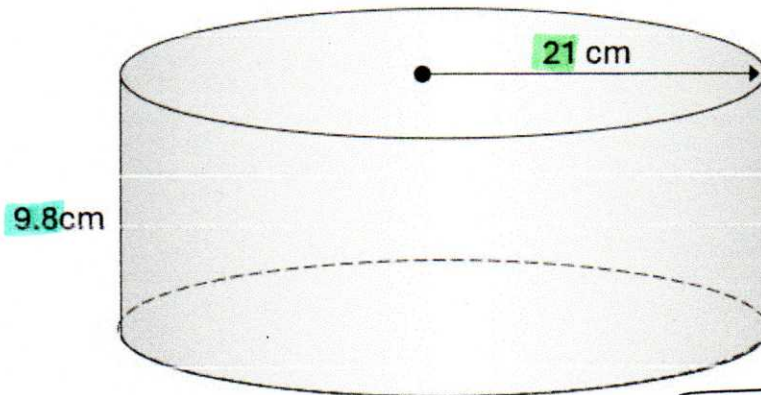


$$\begin{aligned} \text{LCM} &= 7 \times 2 \times 2 \times 2 \times 3 \times 2 \times 3 \\ &= 1008 \end{aligned}$$

1008

(Total for question 2 is 2 marks)

- 3 The diagram shows an empty cylindrical tank.



The tank has a radius of 21 cm and a height of 9.8 cm.

Fluid flows into the tank at a rate of 0.63 litres per minute.

Calculate the number of minutes taken to completely fill the tank.

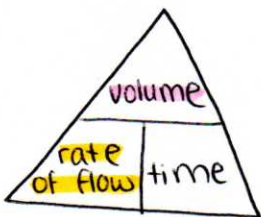
Give your answer correct to the nearest minute.

$$\text{cm}^3 = \text{mL}$$

$$1000 \text{ mL} = 1 \text{ L}$$

$$\text{Volume} = \text{Cross sectional area} \times \text{height} \\ (\pi r^2)$$

$$\begin{aligned} \text{volume} &= \pi r^2 h \\ &= \pi (21)^2 (9.8) = 13577.33513 \dots \text{ cm}^3 \\ &= 13577.33513 \dots \text{ mL} \\ &= 13.577 \dots \text{ L} \end{aligned}$$



$$\begin{aligned} \text{time} &= \frac{\text{Vol}}{\text{rof}} = \frac{13.577}{0.63} = 21.55079 \dots \\ &= 22 \text{ minutes} \end{aligned}$$

22 minutes
(Total for question 3 is 4 marks)

4 Zack's car has a value of £13,000 correct to the nearest £1,000.

(a) Write down the error interval for the value, £V, of the car.

$$\underline{12,500} \leq V < \underline{13,500}$$

(2)

(b) The actual value of Zack's car was £13,200.

A few years later, Zack sells his car for £11,220.

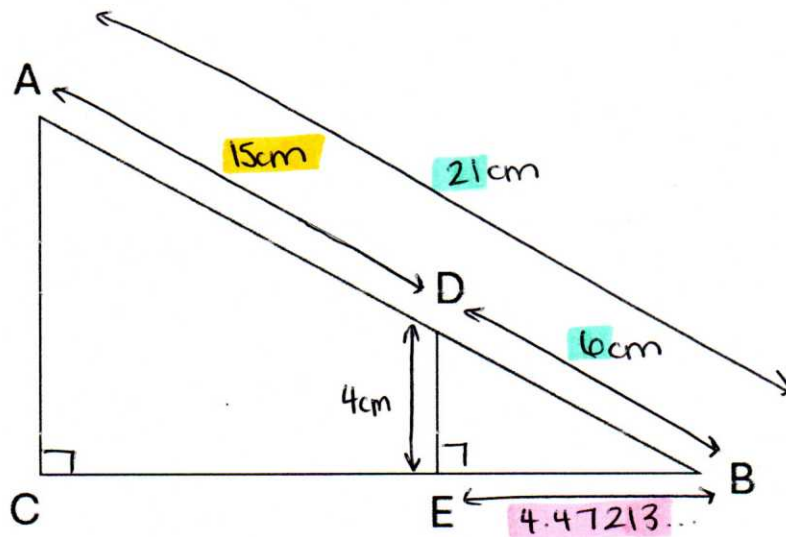
Calculate the percentage loss that Zack makes.

$$\begin{aligned} \% \text{ change} &= \frac{\text{difference}}{\text{original}} \times 100 \\ &= \frac{13,200 - 11,220}{13,200} \times 100 \\ &= 15\% \end{aligned}$$

15 %
(2)

(Total for question 4 is 4 marks)

5



Triangle ABC and Triangle DBE are right angles triangles

AD = 15cm

DE = 4cm

AD : DB = 5 : 2

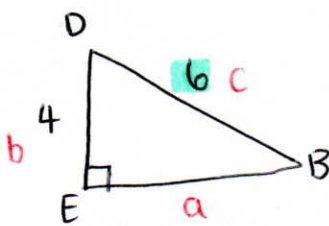
Calculate the length of CB.

Give your answer correct to 3 significant figures.

AD : DB

$$\text{Scale factor} = \frac{21}{6} = 3.5$$

$$\begin{array}{l} \times 3 \swarrow \quad 5 : 2 \\ \quad \quad 15 : 6 \quad \searrow \times 3 \end{array}$$



$$a^2 + b^2 = c^2$$

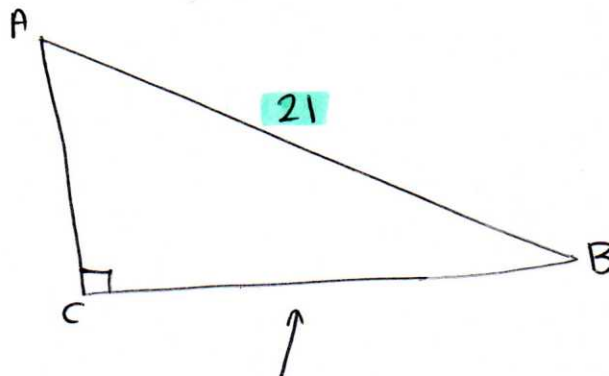
$$a^2 = c^2 - b^2$$

$$a^2 = 6^2 - 4^2$$

$$a^2 = 20$$

$$a = \sqrt{20}$$

$$a = 4.47213...$$



$$4.47213... \times 3.5 = 15.652... \\ = 15.7$$

$$15.7 \text{ cm}$$

(Total for question 5 is 4 marks)

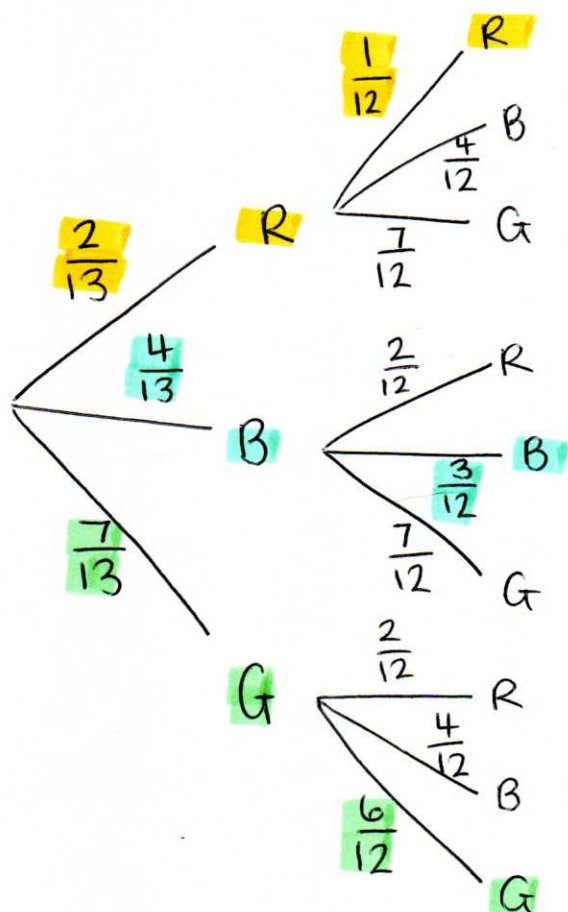
- 6 There are 2 red bottles, 4 blue bottles and 7 green bottles on a shelf.

Khloe takes a bottle of the shelf and keeps it.

$$2 + 4 + 7 = 13$$

Adam takes another bottle from the shelf and keeps it.

What is the probability that both bottles taken from the shelf are the same colour.



$$R \& R = \frac{2}{13} \times \frac{1}{12} = \frac{2}{156}$$

$$B \& B = \frac{4}{13} \times \frac{3}{12} = \frac{12}{156}$$

$$G \& G = \frac{7}{13} \times \frac{6}{12} = \frac{42}{156}$$

$$\frac{2}{156} + \frac{12}{156} + \frac{42}{156} = \frac{56}{156}$$

$$\frac{56}{156} = \frac{14}{39}$$

$$\frac{14}{39} \text{ OR equivalent}$$

(Total for question 6 is 4 marks)

- 7 There are 20 baseball teams in a league.
Each team play 2 matches against each of the other baseball teams.
Work out the total number of matches played.

$$20 \times 19 = 380$$

380

(Total for question 7 is 2 marks)

- 8 Given that $x : y = \frac{3}{4} : 2\frac{1}{2}$ $\rightarrow 2\frac{1}{2} = \frac{5}{2}$

Show that $y = \frac{a}{3}x$ where a is an integer to be found

$$\begin{array}{c}
 x : y \\
 \frac{3}{4} : \frac{5}{2}
 \end{array}
 \rightarrow \frac{3}{4}y = \frac{5}{2}x$$

$$\begin{array}{c}
 (\times 4) \qquad (\times 4) \\
 3y = 10x \\
 (\div 3) \qquad (\div 3) \\
 y = \frac{10}{3}x
 \end{array}$$

$a = 10$

(Total for question 8 is 2 marks)

9 Pedro owns a bakery.

The bakery is closed on Sundays.

In February, Pedro sold 700 brownies.

To work out an estimate for the average number of brownies sold per day in February.

His method is $700 \div 28 = 25$

(a) Is Pedro's method correct. Give reason for your answer.

He only is open 6 days a week, not 7. He should divide by 24.

(1)

(b) Pedro sells chocolate cakes, lemon cakes and vanilla cakes in the ratio 11 : 3 : 8

One week he sold 1430 cakes for a total price of £3068.

Here is his price list for his cakes.

Cakes	
Chocolate	£2.30
Lemon	£2.10
Vanilla	

$$11 + 3 + 8 = 22$$

$$\frac{1430}{22} = 65$$

How much does one vanilla cake cost?

$$C : L : V$$

$$11 : 3 : 8$$

(x65)

$$715 : 195 : 520$$

$$\begin{aligned} \text{chocolate} &= 715 \times £2.30 \\ &= £1644.50 \end{aligned}$$

$$\begin{aligned} \text{Lemon} &= 195 \times £2.10 \\ &= £409.50 \end{aligned}$$

$$\begin{aligned} \text{Vanilla} &= £3068 - £1644.50 - £409.50 \\ &= £1014 \end{aligned}$$

$$£1014 \div 520 = £1.95$$

$$£ \underline{1.95}$$

(4)

(Total for question 9 is 5 marks)

10 Circle C has equations $x^2 + y^2 = 9$

P $\left(-\frac{5}{2}, \frac{\sqrt{11}}{2}\right)$ is a point on circle C.

Find an equation of the tangent to the circle at point P

$$\begin{aligned}\text{gradient radius} &= \frac{\frac{\sqrt{11}}{2}}{-\frac{5}{2}} \div -\frac{5}{2} \\ &= -\frac{\sqrt{11}}{5}\end{aligned}$$

tangent and radius are perpendicular (gradient is negative reciprocal).

$$\text{gradient tangent} = \frac{5}{\sqrt{11}} \times \frac{\sqrt{11}}{11} = \frac{5\sqrt{11}}{11}$$

$$y - y_1 = m(x - x_1)$$

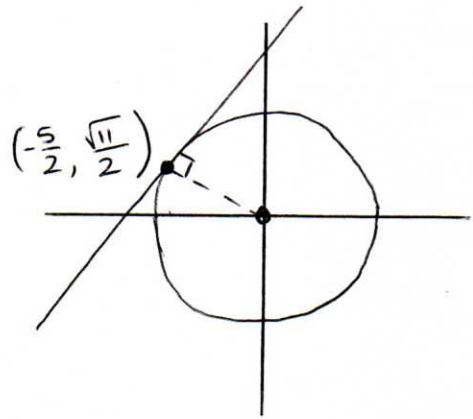
$$y - \frac{\sqrt{11}}{2} = \frac{5\sqrt{11}}{11} \left(x + \frac{5}{2}\right)$$

$$y - \frac{\sqrt{11}}{2} = \frac{5\sqrt{11}}{11}x + \frac{25\sqrt{11}}{22}$$

$$y = \frac{5\sqrt{11}}{11}x + \frac{18\sqrt{11}}{11}$$

OR $11y = 5\sqrt{11}x + 18\sqrt{11}$

$$5\sqrt{11}x - 11y + 18\sqrt{11} = 0$$



$$y = \frac{5\sqrt{11}}{11}x + \frac{18\sqrt{11}}{11}$$

(Total for question 10 is 3 marks)

11 Here are the first three terms of an arithmetic sequence. $\rightarrow$ Same difference between terms

$$x-8$$

$$x+2$$

$$2x-3$$

(a) Work out the value of x .

$$(x+2) - (x-8) = (2x-3) - (x+2)$$

$$x+2-x+8 = 2x-3-x-2$$

$$10 = x-5$$

$$+5$$

$$+5$$

$$15 = x$$

$$x = \underline{15} \quad (2)$$

(b) Here are the first three terms of a geometric sequence. $\rightarrow$ Same ratio between terms

$$y-8$$

$$y+6$$

$$4y+3$$

Given that $y > 0$, work out the value of y .

$$\frac{y+6}{y-8} = \frac{4y+3}{y+6}$$

$$(y+6)(y+6) = (4y+3)(y-8)$$

$$y^2 + 12y + 36 = 4y^2 - 29y - 24$$

$$(-y^2) \quad (-12y) \quad (-36) \quad (-y^2) \quad (-12y) \quad (-36)$$

$$0 = 3y^2 - 41y - 60$$

$$0 = (3y+4)(y-15)$$

$$y = -\frac{4}{3}$$

invalid

$$y = 15$$

$$y = \underline{15} \quad (5)$$

(Total for question 11 is 7 marks)

END OF TEST

TOTAL FOR THIS PAPER IS 40 MARKS