Student's Name: .....

Teacher's Initials: .....

Barker College

LZM DZP
LMD DXC
PDJ* RJW

Thursday 5th September 2019
Period 4 or 5
Time Allowed: 50 minutes

165 copies

YEAR 9
MATHEMATICS
5.3
ASSESSMENT 3

INSTRUCTIONS TO STUDENTS

* **Write ALL answers in the spaces provided.**
* **ALL NECESSARY working for each question must be shown to gain full marks.**
* **Marks may not be awarded for careless or badly arranged working.**
* **DIAGRAMS ARE NOT TO SCALE.**
* **Write in blue or black pen.**
* **NESA-approved, non-programmable calculators may be used.**
* **Detach the formula sheet and return it with your paper.**

Earning Money	/14
Surface Area and Volume	/12
Equations and Inequations	/20
Coordinate Geometry	/9
Problem Solving	/6
Total	/61

Earning Money (14 marks)

1. A carpenter earns $18 per hour for a 38 hour working week, and time and a half for any additional hours worked.

   Calculate the carpenter's wage in a week where he works 42 hours. (2)

2. Helena invested $500 for 5 years into a savings account that earns simple interest of 2% per annum.

   i) Calculate the total interest earned on the investment. (1)

   ii) Find the total value of the investment after 5 years. (1)

3. Sofia is a real estate agent who earns a base wage of $500 per week, plus 2% of all sales she makes.

   Calculate her annual income in a year where she makes $3 000 000 in sales. (Assume 1 year = 52 weeks) (2)

4. Diego took out a loan of $6 000 to purchase a car. The loan charged simple interest of 6% per annum over 2 years.

i) Find the total interest he paid. (1)

ii) Diego made equal monthly repayments over 2 years to repay the loan. Calculate his monthly repayment. (2)

5. Hugo is a marine biologist who earned $72 500 in the last year. He is able to claim tax deductions of $2000 in diving gear and camera equipment.

The income tax table below shows the income tax rates.

Taxable income	Tax on this income
0 – $18,200	Nil
$18,201 – $37,000	19c for each $1 over $18,200
$37,001 – $90,000	$3,572 plus 32.5c for each $1 over $37,000
$90,001 – $180,000	$20,797 plus 37c for each $1 over $90,000
$180,001 and over	$54,097 plus 45c for each $1 over $180,000

i) Calculate Hugo's taxable income. (1)

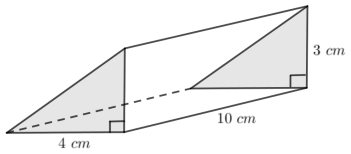
ii) Calculate the tax payable. (2)

iii) Hugo paid $1350 a month in PAYG tax payments throughout the year. How much tax has he already paid? (1)

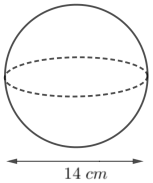
iv) How much will he receive as a tax refund? (1)

Surface Area and Volume (12 marks)

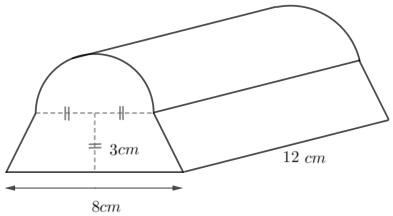
1. Determine the volume of this prism. (2)



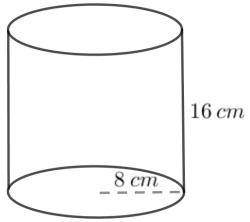
2. Determine the surface area of this sphere. Round your answer to 1 decimal place. (2)



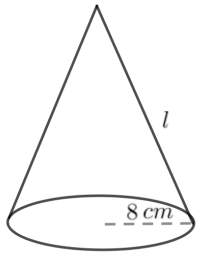
3. Determine the volume of this solid. Round your answer to the nearest cm^3. (3)



4. i) The closed cylinder below has a height of 16 cm and a radius of 8 cm. Find its surface area. Round your answer to the nearest cm^2. (2)



ii) The closed cone below has the same radius as the cylinder above, and a slant height of l cm. Its surface area is equal to the surface area of the closed cylinder. Find the slant height of the cone, rounded to 1 decimal place. (3)



Equations and Inequations (20 marks)

1. Solve for the value of x in each equation.

   a. $3x - 1 = 17$ (1)

   b. $\frac{x-1}{2} + 5 = -3$ (2)

   c. $\frac{x}{4} = \frac{3x+1}{6}$ (3)

2. Consider the formula $E = \frac{1}{2}mv^2$. Find the value of E when $m = 120$ and $v = 0.5$ (2)

3. Solve the inequality $2(x - 5) \geq -4$, showing your solution on the number line. (3)

4. Rearrange the formula $S = \frac{a}{1-r}$ to make r the subject of the formula. (3)

5. Solve the equation : (3)

$$\frac{x+3}{2} + \frac{2-x}{3} = 5$$

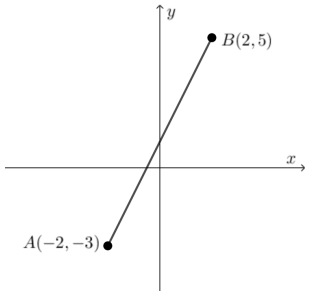
6. Solve the inequality $-3x - 6 < x + 2$. **Graph your solution on a number line**. (3)

Coordinate Geometry (9 marks)

1. Consider the interval joining points $A(-2\,,-3)$ and $B(2\,,5)$. (3)

   a. Find the coordinates of the midpoint of AB.

   b. Find the gradient of interval AB.



   c. Find the length of the interval AB. Round your answer to 1 decimal place.

2. State the equation of a line that:

   a. has a gradient of -3 and a y-intercept of 6. (1)

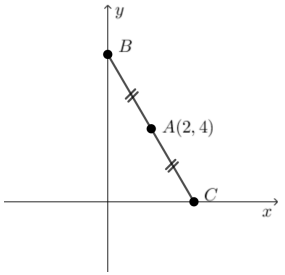
   b. has a gradient of $\frac{2}{3}$ and passes through the point $(6\,,4)$.
   State the equation in gradient-intercept form. (2)

   c. passes through the points $(2\,,-1)$ and $(-1\,,5)$.
   State the equation in gradient-intercept form. (3)

Problem Solving (6 marks)

1. In this diagram, A is the midpoint of BC, with $AB = AC$. (2)

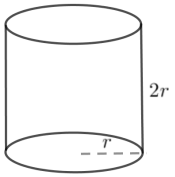
   Determine the coordinates of points B and C.



2. Bank A offers 5 year loans at a simple interest rate of 3.5% per annum. What annual simple interest rate would bank B need to offer on a 3 year loan to result in both banks charging the same total interest?

(2)

3. The cylinder below has a height that is twice its radius. (2)



A sphere and a cone are both made to fit exactly inside the cylinder as shown.

How many of these cones have the equivalent volume of the sphere?

END OF PAPER!

Formula Sheet

Simple Interest

$I = Prn$

Coordinate Geometry

Gradient

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Midpoint

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Distance

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Point – gradient formula

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

Two – point formula

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

Area, Surface Area and Volume

Circle

$Area = \pi r^2$

Parallelogram

$Area = bh$

Rhombus or Kite

$$Area = \frac{1}{2}xy$$

Trapezium

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

Prism

$Volume = Ah$

Pyramid

$$Volume = \frac{1}{3}Ah$$

Cylinder

$Surface\ Area = 2\pi r^2 + 2\pi rh$

$Volume = \pi r^2 h$

Cone

$Surface\ Area = \pi r^2 + \pi rl$

$$Volume = \frac{1}{3}\pi r^2 h$$

Sphere

$Surface\ Area = 4\pi r^2$

$$Volume = \frac{4}{3}\pi r^3$$

Earning Money

1. Wage $= 38\times18 + 4\times38\times1.5$
$= \$912$

2(i) $I = PRN$
$= 500\times0.02\times5$
$= \$50$

(ii) $A = 500 + 50 = \$550$

3. Annual Income
$= 500\times52 + 0.02\times3000000$
$= \$86000$

4(i) $I = PRN$
$= 6000\times0.06\times2$
$= \$720$

(ii) Loan + Interest
$= 6000 + 720$
$= 6720$
Repayments $= \frac{6720}{24}$
$= \$280$ per month for two years.

5(i) Taxable Income
$= 72500 - 2000$
$= 70500$

(ii) Tax $= 3572 + 0.035(70500 - 37000)$
$= \$14459.50$

(iii) PAYG $= 1350\times12$
$= \$16200$

(iv) Refund $= 16200 - 14459.50$
$= \$1740.50$

Surface Area and Volume

1. $V = Ah$
$= \frac{1}{2}\times4\times3\times10$
$= 60\ cm^3$

2. $SA = 4\pi r^2$
$= 4\times\pi\times7^2$
$= 615.8\ cm^2$ (1 d.p.)

3. Area of cross section
$= \frac{\pi r^2}{2} + \frac{1}{2}(a+b)h$
$= \frac{\pi\times3^2}{2} + \frac{1}{2}(6+8)\times3$
$= 35.13716694\ cm^2$

$V = 35.13716694\times12$
$= 421.646\ cm^3$
$= 422\ cm^3$ (nearest cm^3)

4(i) $SA = 2\pi r^2 + 2\pi rh$
$= 2\times\pi\times8^2 + 2\times\pi\times8\times16$
$= 1206.3717$
$= 1206\ cm^2$ (nearest cm^2)

(ii) $SA = \pi r^2 + \pi rL$
$1206 = \pi\times8^2 + \pi\times8L$
$1004.938 = 8\pi L$
$L = 39.9852$
$= 40.0$ cm

Equations and Inequations.

1a) $3x - 1 = 17$
$3x = 18$
$x = 6$

b) $\frac{x-1}{2} + 5 = -3$
$\frac{x-1}{2} = -8$
$x - 1 = -16$
$x = -15$

c) $\frac{x}{4} = \frac{3x+1}{6}$
$6x = 4(3x+1)$
$6x = 12x + 4$
$0 = 6x + 4$
$6x = -4$
$x = -\frac{4}{6} = -\frac{2}{3}$

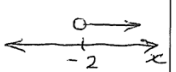
2. $E = \frac{1}{2}\times120\times0.5^2 = 15$

3. $2(x-5) \geq -4$
$2x - 10 \geq -4$
$2x \geq 6$
$x \geq 3$

4. $S = \frac{a}{1-r}$
$S(1-r) = a$
$S - Sr = a$
$-Sr = a - S$
$r = \frac{a-S}{-S}$ OR $\frac{S-a}{S}$

5. $\frac{x+3}{2} + \frac{2-x}{3} = 5$
$\frac{3(x+3)}{6} + \frac{2(2-x)}{6} = 5$
$\frac{3x+9+4-2x}{6} = 5$
$\frac{x+13}{6} = 5$
$x + 13 = 30$
$x = 17$

6. $-3x - 6 < x + 2$
$-6 < 4x + 2$
$-8 < 4x$
$-2 < x$
$x > -2$



Coordinate Geometry

1a) $\left(\frac{-2+2}{2}, \frac{-3+5}{2}\right)$
$= (0, 1)$

b) $m = \frac{5--3}{2--2} = \frac{8}{4} = 2$

c) $d = \sqrt{(2--2)^2 + (5--3)^2}$
$= \sqrt{4^2 + 8^2}$
$= \sqrt{80} = 8.9$ (1 dp)

2a) $y = -3x + 6$

b) $y = \frac{2}{3}x + 6$
$4 = \frac{2}{3}\times6 + c$
$4 = 4 + c$
$c = 0$
$\boxed{y = \frac{2}{3}x}$

2c) $m = \frac{5--1}{-1-2} = \frac{6}{-3} = -2$
$y = -2x + c$
$-1 = -2\times2 + c$
$c = 3$
$\boxed{y = -2x + 3}$

Problem Solving

1. B(0, 8) C(4, 0)

2. Assume a \$100 loan
Bank A $I = PRN$
$= 100\times0.035\times5$
$= \$17.50$
Bank B $I = PRN$
$17.50 = 100\times R\times3$
$17.50 = 300R$
$R = 0.058\dot{3}$
$= 5.8\dot{3}\%$ p.a.

3. $V_{sphere} = \frac{4}{3}\pi r^3$
$V_{cone} = \frac{1}{3}\pi r^2\times2r$
$= \frac{2}{3}\pi r^3$
$\therefore$ 2 cones = 1 sphere.